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Date: August 24, 2006 /Christina M. Padamonsky/
Christina M. Padamonsky

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of:

Applicant(s):	Cyrus E. Tabery *et al.*	Examiner:	Ram N. Kackar
Serial No:	09/955,517	Art Unit:	1763
Filing Date:	September 18, 2001		

Title: *IN-SITU* OR *EX-SITU* PROFILE MONITORING OF PHASE OPENINGS ON ALTERNATING PHASE SHIFTING MASKS BY SCATTEROMETRY

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APPEAL BRIEF

Dear Sir:

Appellants submit this brief in connection with an appeal of the above-identified patent application. A payment *via* credit card is filed concurrently herewith in connection with all fees due regarding the Appeal Brief. In the event any additional fees may be due and/or are not covered by the credit card, the Commissioner is authorized to charge such fees to Deposit Account No. 50-1063 [AMDP753US].

I. Real Party in Interest (37 C.F.R. §41.37(c)(1)(i))

The real party in interest in the present appeal is Advanced Micro Devices, the assignee of the present application.

II. Related Appeals and Interferences (37 C.F.R. §41.37(c)(1)(ii))

Appellants, appellants' legal representative, and/or the assignee of the present application are not aware of any appeals or interferences which may be related to, will directly affect, or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims (37 C.F.R. §41.37(c)(1)(iii))

Claims 15-24 have been withdrawn. Claims 1, 2, 4, 5, 9-12, 25 and 26 stand rejected by the Examiner. The rejection of claims 1, 2, 4, 5, 9-12, 25 and 26 is being appealed.

IV. Status of Amendments (37 C.F.R. §41.37(c)(1)(iv))

There were no amendments submitted after the Final Office Action.

V. Summary of Claimed Subject Matter (37 C.F.R. §41.37(c)(1)(v))

Independent Claim 1

Independent claim 1 and its corresponding dependent claims relate to a system that measures an etch of a mask feature. The system includes one or more mask creating components that fabricate one or more features on an alternating aperture phase shift mask. A driving component is also included that controls the one or more mask creating components. Further, an emitting component that directs light on to at least one of the features on the alternating aperture phase shift mask is included with the system. Finally, an analysis component is also employed to measure one or more feature parameters based on a light reflected and/or refracted from the one or more features, the measured feature parameters are then utilized by the driving component to control the mask creating component during fabrication process to improve the fabrication process of the alternating aperture phase shift mask and post-fabrication process to improve quality control in the alternating aperture phase shift mask. (*See e.g.* Application at p. 8, lines 1-

6 and p. 9, lines 1-4; p. 11, line 25-p. 12, line 16 (Fig. 1, reference nos. 100, 110, 120 and 170); and p. 18, lines 18-31 (Fig. 8, reference nos. 820, 822, 824, 844 and 846)).

Independent Claim 25

Independent claim 25 relates to a system for controlling a process for etching openings in an alternating aperture phase shift mask. The system includes means for sensing at least one of the shape, location, depth, width and opening wall slopes of one or more apertures on the alternating aperture phase shift mask. (*See e.g.* Application at p. 9, lines 12-14; p. 11, line 25-p. 12, line 16 (Fig. 1, reference nos. 100, 110, 120 and 170)). Independent claim 25 also recites means for etching one or more apertures on the alternating aperture phase shift mask. (*See e.g.* Application at p. 9, lines 12-14; p. 11, line 25-p. 12, line 16 (Fig. 1, reference nos. 100, 110, 120 and 170)). Independent claim 25 further recites means for selectively controlling the etching of the one or more apertures based on analysis of data collected by the means for sensing the shape, location, depth, width and opening wall slopes of the one or more apertures. (*See e.g.* Application at p. 9, lines 12-14; p. 11, line 25-p. 12, line 16 (Fig. 1, reference nos. 100, 110, 120 and 170); and p. 12, line 17-p. 13, line 4 (Fig. 2, reference nos. 200, 210, 220 and 270)). Independent claim 25 also recites means for employing the analysis of data *in-situ* to control fabrication of the alternating aperture phase shift mask and *ex-situ* to improve quality control in the alternating aperture phase shift mask. (*See e.g.* Application at p. 9, lines 14-16; p. 9, lines 1-4; p. 11, line 25-p. 12, line 16 (Fig. 1, reference nos. 100, 110, 120 and 170); and p. 18, lines 18-31 (Fig. 8, reference nos. 820, 822, 824, 844 and 846)).

The means for limitations described above are identified as limitations subject to the provisions of 35 U.S.C. §112 ¶6. The structures corresponding to these limitations are identified with reference to the specification and drawings in the above-noted parentheticals.

Independent Claim 26

Independent claim 26 relates to a phase shift mask manufacturing component that fabricates one or more features on an alternating aperture phase shift mask. The phase shift manufacturing component includes a component that directs light on to at least one of the features on the phase shift mask; a processing component that receives reflected and/or refracted

light and measures one or more feature parameters based on the light reflected and/or refracted from the one or more features; and a feedback component that utilizes the measurement of the alternating aperture phase shift mask during fabrication process to adjust the fabrication process of the alternating aperture phase shift mask and during post-fabrication process to improve quality control in the alternating aperture phase shift mask. (*See e.g.* Application at p. 9, lines 14-16; p. 11, line 25-p. 12, line 16 (Fig. 1, reference nos. 100, 110, 120 and 170); p. 12, line 17-p. 13, line 4 (Fig. 2, reference nos. 200, 210, 220 and 270); p. 13, lines 5-24 (Fig. 3, reference nos. 300, 310 and 370) and p. 13, line 25-p. 14, line 21 (Fig. 4, reference nos. 400, 410, 420, 430 and 440)).

VI. Grounds of Rejection to be Reviewed on Appeal (37 C.F.R. §41.37(c)(1)(vi))

A. Whether claims 1, 2, 4, 5, 9-12, 25 and 26 are unpatentable under 35 U.S.C. §102(e) over Subramanian *et al.* (US Patent 6,562,248 B1).

B. Whether claims 1, 2, 4, 5, 10-12, 25 and 26 are unpatentable under 35 U.S.C. §102(e) over Jin *et al.* (US Patent Pub. No. 2002/0028392).

C. Whether claim 9 is unpatentable under 35 U.S.C. §103(a) over Jin *et al.* (US Patent Pub. No. 2002/0028392) in view of Niu *et al.* (US Patent Pub. No. 2002/0131055).

VII. Argument (37 C.F.R. §41.37(c)(1)(vii))

A. Rejection of Claims 1, 2, 4, 5, 9-12, 25 and 26 Under 35 U.S.C. §102(e)

Claims 1, 2, 4, 5, 9-12, 25 and 26 stand rejected as anticipated under 35 U.S.C. §102(e) over Subramanian *et al.* (US Patent 6,562,248 B1). Reversal of this rejection is requested for at least the following reasons. Subramanian *et al.* does not anticipate each and every element as set forth in the subject claims.

> A single prior art reference anticipates a patent claim only if it expressly or inherently describes each and every limitation set forth in the patent claim. *Trintec Industries, Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 63 USPQ2d 1597 (Fed. Cir. 2002); *See*

> *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the … claim. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Appellants' claimed invention relates to a system that facilitates monitoring, measuring and/or controlling the fabrication of apertures in alternating aperture phase shift masks employed in semiconductor manufacturing. Independent claims 1, 25 and 26 recite similar limitations, namely: *a system that measures an etch of a mask feature, comprising, one or more mask creating components…; a driving component that controls the one or more mask creating components; an emitting component…; and an analysis component that measures one or more feature parameters based on a light reflected and/or refracted from the one or more features via a scatterometry system,* ***the measured feature parameters utilized by the driving component to control the mask creating component during fabrication process to improve the fabrication process of the alternating aperture phase shift mask and during post-fabrication process to improve quality control in the alternating aperture phase shift mask***. Subramanian *et al.* does not expressly or inherently disclose the aforementioned novel aspects of appellants' invention as recited in the subject claims.

More particularly, Subramanian *et al.* does not disclose or suggest an analysis component that measures one or more feature parameters, ***the measured feature parameters utilized by the driving component to control the mask creating component during fabrication process to improve the fabrication process of the alternating aperture phase shift mask and during post-fabrication process to improve quality control in the alternating aperture phase shift mask,*** as recited in independent claim 1. The Final Office Action contends the following:

> Subramanian *et al.* teaches a system for creating a complimentary phase shift mask, comprising: a mask creating component 16 operable to create features 12 in a mask14; a measurement component 18 operable to measure the shape, depth and/or width of the apertures 12 created in the mask 14, the measurement component 18 includes a scatterometry system for detecting the reflected and/or diffracted light; and a control system 17 operatively coupled to the etching system 16 and the measurement component 18, the control system 7 is programmed and/or configured to control the etching system 16 in accordance with the measured characteristic of the features. (col. 7, line 10-col. 8, line

> 48, col. 9, line 11-col. 10, line 65). It is inherent that the measuring system could be used to improved quality control by measuring critical dimensions.

(*See* Final Office Action (dated May 4, 2006), pages 2-3). More specifically, the Final Office Action contends that the complimentary phase shift mask and alternating aperture phase shift mask are considered the same, as the apparatus as disclosed is inherently capable of being used for creating either of the phase shift masks. (*See* Final Office Action (dated May 4, 2006), page 3). Appellants respectfully disagree.

Subramanian *et al.* discloses a system for monitoring and controlling aperture etching in a complimentary phase shift mask. The system includes one or more etching components operative to etch portions of a mask; an etching component driving system; a system for directing light onto the apertures; a measuring system for measuring aperture parameters; a scatterometry system for processing the light reflected from the apertures; and a processor for receiving aperture data and mapping the mask into a plurality of grid blocks. (*See* Col. 15, lines 15-40). Subramanian *et al*. does not expressly or inherently disclose a system that facilitates the fabrication of apertures in an alternating aperture phase shift mask, but is instead limited to a system that controls the fabrication of aperture etching in a complimentary phase shift mask.

A complimentary phase shift mask is inherently different from an alternating aperture phase shift mask. A complimentary phase shift mask is created by a two-step masking process. In the masking process, two masks are used to expose a gate layer, wherein light passing through one or more masks may be phase shifted to facilitate selective interference and cancellation of light waves. Then, a second masking operation is performed after the phase shift masking operation. In this second masking operation, the complimentary features are obliterated by exposure to light passing through a second mask prior to forming the patterned resist layer. The second masking operation is typically performed using a binary mask which prevents exposure of the photoresist layer where features are desired and allows exposure of the photoresist layer in the other regions. To take advantage of complimentary phase shift masking, precise control of the depth and/or width of the openings in the complimentary phase shift masks is required. (*See* Col. 2, lines 54-67 and Col. 3, lines 1-10).

Unlike the complimentary phase shift mask, an alternating aperture phase shift mask is created by a one-step masking process. Typically, transparent films are deposited over the

desired transparent areas using a second level lithography and etch technique or vertical trenches are etched directly in the substrate. This creates transmission regions on either side of a patterned opaque feature, with one of these transmission regions being phase-shifted from the other. Controlling the width and depth of these regions etched into the substrate is required to enable controlled phase shifting of light that will pass through the mask. Thus, Subramanian *et al*. is silent regarding a system that facilitates monitoring, measuring and/or controlling the fabrication of apertures in ***alternating aperture phase shift masks***.

Furthermore, Subramanian *et al.* does not disclose the *in-situ* and *ex-situ* monitoring and control of features of an alternating aperture phase shift mask. Appellants' system for measuring, monitoring and/or controlling alternating aperture phase shift mask fabrication can be employed *in-situ* (*e.g.* during fabrication) to control the fabrication of the mask and/or can be employed *ex-situ* (*e.g.* post-fabrication) in processes like quality control. (*See* pg. 12, lines 23-32). Specifically, the system includes using etching components to etch apertures and/or gratings in the mask, determining the acceptability of the apertures and/or gratings etched in the mask and using *in-situ* coordinating control of the etching components to more optimally etch the apertures in the mask and/or *ex-situ* monitoring to determine whether an acceptable mask has been fabricated. (*See* pg. 9, lines 5-11). The system provides an analysis component that measures one or more feature parameters, the measured feature parameters are then utilized by the driving component to control the mask creating component. The mask creating component is then monitored *in-situ* to control fabrication of the alternating aperture phase shift mask and *ex-situ* to improve quality control in the alternating aperture phase shift mask. Thus, the *in-situ* and *ex-situ* monitoring and control of feature parameters is directed to a particular structure, as it is utilized by the driving component to control the mask creating component.

In contrast, the system of Subramanian *et al.* includes a measurement component to measure the shape, depth and/or width of the apertures in the mask, a detection component for detecting the reflected light, and a control system to configure and control operation of the etching system. (*See* col. 7, lines 31-48). Thus, Subramanian *et al.* is silent with regard to a system that measures an etch of a mask feature by…, ***selectively controlling the etching of one or more apertures based on analysis of data collected and employing the analysis of data in-situ to control fabrication of the alternating aperture phase shift mask and ex-situ to improve***

quality control in the alternating aperture phase shift mask. Accordingly, Subramanian *et al.* does not disclose each and every element as set forth in the subject claims.

In addition, the Examiner is reminded that the standard by which anticipation is to be measured is ***strict identity*** between the cited document and the invention as claimed, not mere equivalence or similarity. *See*, *Richardson* at 9 USPQ2d 1913, 1920. This means that in order to establish anticipation under 35 U.S.C. §102, the single document cited must not only expressly or inherently describe each and every limitation set forth in the patent claim, but also the identical invention must be shown in as complete detail as is contained in the claim. The fact that Subramanian *et al.* fails to disclose a system for measuring and fabricating features on an alternating aperture phase shift mask, let alone, ***selectively controlling the etching of one or more apertures based on analysis of data collected and employing the analysis of data in-situ to control fabrication of the alternating aperture phase shift mask and ex-situ to improve quality control in the alternating aperture phase shift mask***, leads appellants to the inexorable belief and conclusion that Subramanian *et al.* does not provide an invention identical to that recited in the subject claims.

In view of at least the foregoing, it is readily apparent that Subramanian *et al.* does not anticipate or suggest the subject invention as recited in claims 1, 25 and 26 (and claims 2, 4-5 and 9-12 which respectively depend there from). Accordingly, this rejection should be reversed.

B. Rejection of Claims 1, 2, 4, 5, 10-12, 25 and 26 Under 35 U.S.C. §102(e)

Claims 1, 2, 4, 5, 10-12, 25 and 26 stand rejected as anticipated under 35 U.S.C. §102(e) over Jin *et al.* (US Patent Pub. No. 2002/0028392). It is respectfully submitted that this rejection should be withdrawn for at least the following reasons. Jin *et al.* does not anticipate each and every element as set forth in the subject claims.

As stated *supra*, appellants' claimed invention relates to a system that facilitates monitoring, measuring and/or controlling the fabrication of apertures in alternating aperture phase shift masks employed in semiconductor manufacturing. Independent claims 1, 25 and 26 recite similar limitations, namely: *a system that measures an etch of a mask feature, comprising, one or more mask creating components…; a driving component that controls the one or more mask creating components; an emitting component…; and an analysis component that measures one or more feature parameters based on a light reflected and/or refracted from the one or more*

features via a scatterometry system, ***the measured feature parameters utilized by the driving component to control the mask creating component during fabrication process to improve the fabrication process of the alternating aperture phase shift mask and during post-fabrication process to improve quality control in the alternating aperture phase shift mask***. Jin *et al.* does not expressly or inherently disclose the aforementioned novel aspects of appellants' invention as recited in the subject claims.

More particularly, Jin *et al.* does not disclose or suggest an analysis component that measures one or more feature parameters, ***the measured feature parameters utilized by the driving component to control the mask creating component during fabrication process to improve the fabrication process of the alternating aperture phase shift mask and during post-fabrication process to improve quality control in the alternating aperture phase shift mask,*** as recited in independent claim 1. The Final Office Action contends the following:

> Jin *et al.* teaches a system for fabricating an alternating aperture phase shift mask, comprising: a mask fabricating component with control of optical properties and thickness; a measurement component for physical and optical monitoring and; and a control system to control the fabrication process to achieve desired results depending upon monitored parameters (Paragraphs 25, 129, 131, 148 and 166).

(*See* Final Office Action (dated May 4, 2006), page 3). More specifically, the Final Office Action contends that the emitting component that directs light and the analysis component that measures reflected or refracted light are inherent in view of the teachings that "desired optical transmission and phase-shifting functions of the mask are achieved by controlling the optical properties and thickness of constituent film layers." (*See* Final Office Action (dated May 4, 2006), pages 3-4). Appellants respectfully disagree.

Jin *et al.* relates to the use of multilayer film stacks and gray scale processing method to fabricate phase-shifting masks (PSMs) utilized in lithography. Desired optical transmission and phase-shifting functions of the mask are achieved by controlling the optical properties and thickness of constituent film layers. By substantially separating the phase shift and attenuation functions between different film layers, the phase shift mask of Jin *et al.* can be tuned for optimal performance at various wavelengths more precisely than conventional masks employing a single layer to control both attenuation and phase shifting. (*See* pg. 2, paragraph [0025]).

Jin *et al.* does not disclose the *in-situ* and *ex-situ* monitoring and control of features of an alternating aperture phase shift mask. As stated *supra*, appellants' system for measuring, monitoring and/or controlling alternating aperture phase shift mask fabrication can be employed *in-situ* (*e.g.* during fabrication) to control the fabrication of the mask and/or can be employed *ex-situ* (*e.g.* post-fabrication) in processes like quality control. (*See* pg. 12, lines 23-32). Specifically, the system includes using etching components to etch apertures and/or gratings in the mask and using *in-situ* coordinating control of the etching components to more optimally etch the apertures in the mask and/or *ex-situ* monitoring to determine whether an acceptable mask has been fabricated. (*See* pg. 9, lines 5-11). The system provides an analysis component that measures one or more feature parameters, the measured feature parameters are then utilized by the driving component to control the mask creating component. The mask creating component is then monitored *in-situ* to control fabrication of the alternating aperture phase shift mask and *ex-situ* to improve quality control in the alternating aperture phase shift mask. Thus, the *in-situ* and *ex-situ* monitoring and control of feature parameters is directed to a particular structure, as it is utilized by the driving component to control the mask creating component.

In contrast, Jin *et al.* utilizes multilayer structures which provide etch selectivity. The desired optical transmission at a given wavelength is achieved by adjusting optical properties and thickness of an attenuating layer and employing gray-scale electron beam lithography. (*See* pg. 3, paragraph [0051]). In one embodiment, the use of a multilayer mask in connection with lithography, accurately and uniformly defines the attributes of an alternating aperture phase shifting mask without requiring *in-situ* monitoring of etch depth. (*See* pg. 5, paragraph [0077]). Accordingly, Jin *et al.* is silent with regard to a system that measures an etch of a mask feature, comprising, ...***the measured feature parameters utilized by the driving component to control the mask creating component during fabrication process (e.g., in-situ) to improve the fabrication process of the alternating aperture phase shift mask and during post-fabrication process (e.g., ex-situ) to improve quality control in the alternating aperture phase shift mask***.

Furthermore, Jin *et al.* does not disclose a scatterometry system for profiling the feature parameters based on a light reflected and/or refracted from the one or more features. (*See* Office Action dated 1-17-06, pg. 4). Appellants' claimed invention measures one or more feature parameters based on a light reflected and/or refracted from the one or more features *via* a scatterometry system. The measured feature parameters are then utilized by a driving component

to monitor and control a mask creating component. Accordingly, Jin *et al.* is silent with regard to a system that measures an etch of a mask feature, comprising, ***an analysis component that measures one or more feature parameters based on a light reflected and/or refracted from the one or more features via a scatterometry system,***....

In addition, the Examiner is reminded that the standard by which anticipation is to be measured is ***strict identity*** between the cited document and the invention as claimed, not mere equivalence or similarity. The fact that Jin *et al.* fails to disclose a scatterometry system for profiling the feature parameters based on a light reflected and/or refracted from the one or more features system for measuring and fabricating features on an alternating aperture phase shift mask, let alone, ***selectively controlling the etching of one or more apertures based on analysis of data collected and employing the analysis of data in-situ to control fabrication of the alternating aperture phase shift mask and ex-situ to improve quality control in the alternating aperture phase shift mask***, leads appellants to the inexorable belief and conclusion that Jin *et al.* does not provide an invention identical to that recited in the subject claims.

In view of at least the foregoing, it is readily apparent that Jin *et al.* does not anticipate or suggest the subject invention as recited in claims 1, 25 and 26 (and claims 2, 4-5 and 10-12 which respectively depend there from). Accordingly, this rejection should be reversed.

C. Rejection of Claim 9 Under 35 U.S.C. §103(a)

Claim 9 stands rejected as obvious under 35 U.S.C. §103(a) over Jin *et al.* (US Patent Pub. No. 2002/0028392) in view of Niu *et al.* (US Patent Pub. No. 2002/0131055). Reversal of this rejection is requested for at least the following reasons. Jin *et al.* and Niu *et al.*, individually or in combination, do not teach or suggest each and every element set forth in the subject claims. In particular, Niu *et al.* does not make up for the aforementioned deficiencies of Jin *et al.* with respect to independent claim 1 (which claim 9 depends from). Thus, the subject invention as recited in claim 9 is not obvious over the combination of Jin *et al.* and Niu *et al.* Therefore, it is respectfully submitted that this rejection be withdrawn.

D. Conclusion

For at least the above reasons, the claims currently under consideration are believed to be patentable over the cited references. Accordingly, it is respectfully requested that the rejections of claims 1, 2, 4, 5, 9-12, 25 and 26 be reversed.

If any additional fees are due in connection with this document, the Commissioner is authorized to charge those fees to Deposit Account No. 50-1063 [AMDP753US].

Respectfully submitted,

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VIII. Claims Appendix (37 C.F.R. §41.37(c)(1)(viii))

1. A system that measures an etch of a mask feature, comprising:

one or more mask creating components that fabricate one or more features on an alternating aperture phase shift mask;

a driving component that controls the one or more mask creating components;

an emitting component that directs light on to at least one of the features on the alternating aperture phase shift mask; and

an analysis component that measures one or more feature parameters based on a light reflected and/or refracted from the one or more features *via* a scatterometry system, the measured feature parameters utilized by the driving component to control the mask creating component during fabrication process to improve the fabrication process of the alternating aperture phase shift mask and during post-fabrication process to improve quality control in the alternating aperture phase shift mask.

2. The system of claim 1, comprising a processor operatively coupled to the measuring system and the fabricating component driving system.

3. (Cancelled)

4. The system of claim 1, the fabricating components are etching components.

5. The system of claim 1, the features comprise at least one of an aperture and a grating.

6-8. (Cancelled)

9. The system of claim 1, the processor maps the mask into a plurality of grid blocks and makes a determination of fabrication conditions at the one or more grid blocks.

10. The system of claim 1, the fabrication conditions comprise at least one of the depth, width and profile of the features.

11. The system of claim 1, the processor determines the existence of an unacceptable fabrication condition for the one or more features based upon a determined feature signature differing from an acceptable feature signature.

12. The system of claim 2, the processor controls the one or more fabricating components to regulate fabricating the one or more features on the mask.

13-14. (Cancelled)

15. (Withdrawn) A system for monitoring the profile of an aperture on an alternating aperture phase shift mask, the system comprising:

a system for directing light onto an alternating aperture phase shift mask; and

a measuring system for measuring one or more aperture parameters based on a light reflected from the aperture.

16. (Withdrawn) The system of claim 15, the aperture parameters comprise at least one of aperture depth, aperture width and aperture wall slope.

17. (Withdrawn) The system of claim 15, comprising a processor adapted to receive aperture data from the measuring system and to facilitate determining whether the alternating aperture phase shift mask has been fabricated within one or more pre-determined tolerances.

18. (Withdrawn) The system of claim 17, the pre-determined tolerances comprise at least one of aperture depth, aperture width and aperture wall slope.

19. (Withdrawn) The system of claim 15, the measuring system comprises a scatterometry system for processing the light reflected from an aperture to determine an aperture signature.

20. (Withdrawn) The system of claim 15, the processor determines whether the mask has been fabricated within one or more pre-determined tolerances based upon a determined aperture signature differing from an acceptable aperture signature.

21. (Withdrawn) A method for monitoring and controlling aperture etching in an alternating aperture phase shift mask, comprising:

etching one or more apertures on the alternating aperture phase shift mask;

directing light onto at least one of the one or more apertures;

collecting light reflected from the at least one aperture;

employing scatterometry to analyze the reflected light to determine at least one of the depth, shape, location, profile and width of the at least one aperture; and

selectively controlling the etching of the one or more apertures in the mask.

22. (Withdrawn) The method of claim 21 comprising:

etching one or more gratings on the alternating aperture phase shift mask;

directing light onto at least one of the one or more gratings;

collecting light reflected from the at least one grating; and

employing scatterometry to analyze the reflected light to determine at least one of the depth, shape, location, profile and width of the at least one grating.

23. (Withdrawn) A method for determining whether an alternating aperture phase shift mask has been fabricated with desired aperture etching parameters, comprising:

etching one or more apertures on the alternating aperture phase shift mask;

directing light onto at least one of the one or more apertures;

collecting light reflected from the at least one aperture;

employing scatterometry to analyze the reflected light to determine at least one of the depth, shape, location, profile and width of the at least one aperture; and

determining the acceptability of the alternating aperture phase shift mask based on at least one of the depth, shape, location, profile and width of the at least one aperture.

24. (Withdrawn) The method of claim 23 comprising:

etching one or more gratings on the alternating aperture phase shift mask;

directing light onto at least one of the one or more gratings;

collecting light reflected from the at least one grating; and

employing scatterometry to analyze the reflected light to determine at least one of the depth, shape, location, profile and width of the at least one grating.

25. A system for controlling a process for etching openings in an alternating aperture phase shift mask, comprising:

means for sensing at least one of the shape, location, depth, width and opening wall slopes of one or more apertures on the alternating aperture phase shift mask;

means for etching one or more apertures on the alternating aperture phase shift mask;

means for selectively controlling the etching of the one or more apertures based on analysis of data collected by the means for sensing the shape, location, depth, width and opening wall slopes of the one or more apertures; and

means for employing the analysis of data *in-situ* to control fabrication of the alternating aperture phase shift mask and *ex-situ* to improve quality control in the alternating aperture phase shift mask.

26. A phase shift mask manufacturing component that fabricates one or more features on an alternating aperture phase shift mask, comprising:

a component that directs light on to at least one of the features on the alternating aperture phase shift mask;

a processing component receives reflected and/or refracted and measures one or more feature parameters based on the light reflected and/or refracted from the one or more features; and

a feedback component that utilizes the measurement of the alternating aperture phase shift mask during fabrication process to adjust the fabrication process of the alternating aperture phase shift mask and during post-fabrication process to improve quality control in the alternating aperture phase shift mask.

IX. Evidence Appendix (37 C.F.R. §41.37(c)(1)(ix))

None.

X. Related Proceedings Appendix (37 C.F.R. §41.37(c)(1)(x))

None.